

## ATMOSPHERIC ELECTRICITY.

## AURORAS.

Auroras were observed during the month as follows: 2d, Poplar River, Mont. 5th, Poplar River, Mont. 8th, Eastport and Orono, Me. 10th, Fort Buford, Dak.; Saint Vincent, Minn.; Poplar River, Mont. 12th, Fort Buford, Dak.; Eastport, Me.; Poplar River, Mont. 13th, Fort Totten and Webster, Dak.; Moorhead and Saint Vincent, Minn.; Poplar River, Mont.; Fort Laramie, Wyo. 17th, Webster, Dak. 20th, Richardton, Dak. 21st, Duluth and Moorhead, Minn. 22d, Cornish, Me.; Alpena, Mich.; Moorhead and Saint Vincent, Minn.; Ardenia, N. Y.; Garrettsville, Ohio; Spokane Falls, Wash. 24th, Cornish, Me.

Of the above displays, the most brilliant were those observed during the night of the 21st-22d at Duluth and Moorhead, Minn., where the aurora appeared in the form of a bright arch, with shooting beams, reaching nearly to the zenith.

## THUNDER-STORMS.

Thunder-storms are reported in the various states as follows:

1st, Lead Hill, Ark.; New London, Conn.; Cairo, Ill.; Dudley, Mass.; Nashua, N. H.; Setauket, N. Y.; Hatteras, N. C.; Jacksonborough, Ohio; Yaquima Light House, Oregon; Milan, Tenn. 2d, Lead Hill, Ark.; New Haven and New London, Conn.; Webster, Dak.; Archer, Fla.; Cairo, Charleston, Chicago, and Springfield, Ill.; Indianapolis, Logansport, and Terre Haute, Ind.; Cedar Rapids, Clinton, Cresco, Davenport, Independence, and Monticello, Iowa; Frankfort, Ky.; Portland, Me.; Amherst, Blue Hill Observatory, Deerfield, New Bedford, Somerset, Taunton, and Westborough, Mass.; Kalamazoo, Lansing, and Mottville, Mich.; Saint Paul, Minn.; Lamar, Mo.; Setauket, N. Y.; Wellsborough, Pa.; Embarras, Fond du Lac, and Manitowoc, Wis. 3d, Archer and Key West, Fla.; New Bedford, Mass.; Berlin Mills and Manchester, N. H.; Atlantic City, N. J.; Humphrey, Oswego, Palmyra, and Rochester, N. Y.; Cincinnati and Yellow Springs, Ohio; Parkersburg, W. Va. 4th, Voluntown, Conn.; Portland, Me.; Blue Hill Observatory, Dudley, Fall River, Somerset, Taunton, and Westborough,

Mass.; Berlin Mills and Nashua, N. H.; Buffalo and Le Roy, N. Y.; Cleveland, Ohio; Manchester and Strafford, Vt. 5th, Sandwich, Ill.; Albia, Cedar Rapids, Clinton, Independence, Monticello, and Mount Vernon, Iowa; Grand Haven, Mich.; DeSoto and Omaha, Nebr.; Beloit, Delavan, Embarras, Fond du Lac, Green Bay, La Crosse, Madison, Manitowoc, and Milwaukee, Wis. 6th, Charleston and Chicago, Ill.; Davenport, Cresco, Independence, and Keokuk, Iowa; Grand Haven, Lansing, Mottville, and Traverse City, Mich.; Fayette Mo.; Napoleon, Waukeon, and Yellow Springs, Ohio; Yaquima Light House, Oregon; Delavan, Green Bay, La Crosse, Manitowoc, and Milwaukee, Wis. 7th, Las Animas, Colo.; Independence, Iowa; Grand Haven, Mottville, and Thornville, Mich.; Duluth, Moorhead, and Saint Paul, Minn.; Westtown, Pa.; Corpus Christi, Tex.; Port Angeles, Wash.; La Crosse, Madison, and Milwaukee, Wis. 8th, Tucson and Yuma, Ariz.; Salina and Wakefield, Kans.; Corpus Christi, Palestine, and San Antonio, Tex.; Fond du Lac, Wis. 9th, Lewis Creek, Cal.; Wakefield, Kans.; San Antonio, Tex. 10th, Tucson and Willcox, Ariz.; Galveston and New Ulm, Tex. 11th, Los Angeles and Riverside, Cal.; Cedar Keys and Limona, Fla.; Humphrey, N. Y. 12th, Cedar Keys and Limona, Fla. 13th, Willcox, Ariz.; Fort Lewis, Colo.; Cedar Keys, Fla.; Charleston, Ill.; Frisco, Utah. 14th, Key West, Fla.; Fort Union, N. Mex. 15th, Denver, Grand Junction, and Los Animas, Colo.; Fort Sully and Parkston, Dak.; Moorhead, Minn. 16th, Key West, Fla.; West Leavenworth, Kans.; Hiram, Ohio; Madison, Wis. 17th, Buffalo and Humphrey, N. Y.; Elyria and Garrettsville, Ohio. 18th, Tucson, Ariz. 19th, Fort Thomas, Ariz.; Merritt's Island, Fla. 20th, Buffalo and Fort Niagara, N. Y.; Corry, Meadville, and Pittsburg, Pa. 21st, Ardenia, Boyd's Corners, and Humphrey, N. Y. 22d, Salina, Kans.; Hudson, Mich. 23d, Clinton, Iowa; Globe, Lebo, and West Leavenworth, Kans.; Hudson, Mich. 24th, Corpus Christi, Palestine, and Rio Grande City, Tex. 25th, Fort Thomas, Ariz. 26th, Cedar Keys and Archer, Fla. 28th, Archer, Cedar Keys, and Duke, Fla. 29th, University of Virginia, Va. 31st, Chicomicomico, Hatteras, and Wash Woods, N. C.

## MISCELLANEOUS PHENOMENA.

## FOREST AND PRAIRIE FIRES.

Fort Bidwell, Cal.: fires were burning in the swamps three or four miles southwest of this place on the 4th.

Moorhead, Minn.: fires were burning in the prairies south of station during the afternoon and night of the 14th.

Saint Vincent, Minn.: fires were burning on the prairies near this place on the 15th. The air was full of smoke on the 18th.

Little Rock, Ark., 19th: forest fires were raging four miles northeast of this city. On the 21st the fires were still burning and were causing considerable damage.

San Diego, Cal.: brush fires prevailed north and northeast of this place on the 21st. Light smoke from fires burning in the mountains north and east of here overspreads this region.

Los Angeles, Cal., 22d: extensive fires have prevailed for several days past in the Santa Monica Mountain Range, destroying a considerable amount of timber; extensive fires are also reported in the San Bernardino Mountains. The 23d an extensive brush fire was burning on the hills east of this city.

Forest and prairie fires are also reported to have occurred as follows: Moorhead, Minn., 12th, 18th, 23d, 28th to 30th; Bismarck, Dak., 18th; Parkston, Dak., 20th; North Platte, Nebr., 19th, 28th; Little Rock, Ark., 22d, 23d.

## METEORS.

Indianapolis, Ind.: an unusually bright meteor was observed at 9 p. m. on the 3d; it shot along a central arc of the sky, starting about 40° above the eastern horizon, moved a little

north of west, and disappeared when about half way between Ursa Minor and the zenith.

Moorestown, Burlington Co., N. J.: a meteor apparently three or four times the size of Venus was observed in the west-southwest at 6.30 p. m. on the 5th; when in altitude 40° it separated into two parts and disappeared when in altitude 35°.

Los Angeles, Cal.: a brilliant meteor is reported to have been observed about 7.10 p. m. on the 8th in the western sky; as it passed through the air it grew in size until it appeared to be about as large as the moon, when it suddenly burst in many pieces; its light when first seen was white and similar to that of an electric light, and when it burst the sky was illuminated as by an electric flash.

Dale Enterprise, Rockingham Co., Va.: a meteor, which illuminated the whole country, was observed at 9.40 p. m. on the 8th; it moved in a southeasterly direction, and after having passed a distance of twenty-four degrees it exploded.

Stateburg, Sumter Co., S. C.: a meteor was observed in the east at about 9.05 p. m. on the 12th; it moved from near the meridian eastward and downward, and disappeared about 10° south of Pleiades. In less than a minute another meteor, not so bright, appeared 8° or 10° north of the first, and pursued a parallel course; almost simultaneously with this latter meteor, and from nearly the same point in the heavens, a very small meteor shot off towards the North Star.

Mr. A. K. Holt, voluntary observer at Riverside, San Bernardino, Co., Cal., reports:

Shortly after midnight on the morning of October 18th, a most wonderful meteor was observed in the southwest. At first it was a bright ball of fire and increased in size and brilliancy with marvelous rapidity.

Oroville, Butte Co., Cal.: a meteor was observed at 4.55 a. m. on the 19th, passing in a direction from northwest to southeast; it was larger and more brilliant than the planet Venus; its flight was rapid, lasting eight seconds.

Keeler, Cal.: a meteor was observed at 7 a. m. on the 19th; it was first seen in altitude 48° and azimuth 135°, and last seen in altitude 40° and azimuth 100°. About three seconds previous to its disappearance it burst into six brightly colored balls, each of which was apparently about ten times the size of the meteor as first seen, and displayed red, violet, green, yellow, dark blue, and orange colors.

Abilene, Tex.: a very bright meteor was observed in the southwest at 6.34 p. m. on the 22d; it moved toward the north and exploded when to the northwest of station, the fragments flying in every direction.

Fort Maginnis, Mont.: a meteor apparently of unusual size passed in a direction from southeast to northwest at 11.20 p. m. on the 30th. On account of the light from the full moon the meteor did not appear very brilliant.

Meteors were also observed on the following dates:

3d, East Norway, Kans. 4th, Topeka, Kans. 6th, Archer and Key West, Fla.; Summit, Mass.; Rappahannock, Va.; Vashon, Wash. 7th, Woodstock, Md.; Clayton, N. J.; Cedar Springs, S. C.; Dale Enterprise, Va. 8th, Archer, Fla. 10th, Archer, Fla. 11th, Webster, Dak.; Woodstock, Md.; Cleburne, Tex.; Cheyenne, Wyo. 12th, Parkston, Dak.; Cleburne, Tex. 13th, Davenport, Iowa; Jacksonborough, Ohio; Dale Enterprise, Va. 14th, Nashua, N. H.; Dale Enterprise, Va. 15th, Somerset, Mass.; Nashua, N. H. 17th, Lead Hill, Ark.; Voluntown, Conn.; Beverly, N. J. 18th, Lead Hill, Ark.; Oahuenga, Cal.; Voluntown, Conn.; Vevay, Ind.; Nashua, N. H. 19th, Oahuenga and Los Angeles, Cal.; Woodstock, Md. 20th, Davenport, Iowa; Somerset, Mass.; Wytheville, Va. 21st, Archer and Manatee, Fla.; Statesville, S. C. 22d, Mount Angel, Oregon. 23d, Clayton, N. J.; Dale Enterprise, Va. 24th, Fort Sully, Dak.; Davenport, Iowa. 25th, Davenport, Iowa. 26th, Little Rock, Ark.; Elk Falls, Kans. 27th, Kalamazoo, Mich.; Cleburne, Tex. 30th, Davenport, Iowa. 31st, New Haven, Conn.; Manatee, Fla.; New Bedford, Mass.

#### MIGRATION OF BIRDS.

*Geese flying southward.*—Mobile, Ala., 8th; Fort Mojave, Ariz., 2d, 3d; Fort Bidwell, Cal., 11th, 23d, 25th; Sacramento, Cal., 7th, 10th to 12th, 15th, 19th, 20th, 28th, 31st; North Colebrook, Conn., 27th; Fort Buford, Dak., 20th, 21st; Fort Sully, Dak., 2d, 25th, 29th; Fort Meade, Dak., 4th, 6th; Washington City, 23d, 25th; Charleston, Ill., 21st; Laconia, Ind., 29th; Fort Reno, Ind. T., 14th; Fort Sill, Ind. T., 5th, 13th, 16th; Cedar Rapids, Iowa, 20th; Dodge City, Kans., 4th; Manhattan, Kans., 21st; Ninnescah, Kans., 16th, 17th, 28th; Wakefield, Kans., 3d; Yates Centre, Kans., 24th; Grand Haven, Mich., 28th, 29th; Harrisville, Mich., 13th, 24th, 25th; Lansing, Mich., 26th; Marquette, Mich., 21st; Mottville, Mich., 18th,

19th, 20th, 24th, 25th; Saint Louis, Mo., 23d; Fort Assinaboine, Mont., 9th; Fort Custer, Mont., 12th; Fort Maginnis, Mont., 26th; Orete, Nebr., 19th, 28th; Tecumseh, Nebr., 22d; Clayton, N. J., 26th; Moorestown and New Brunswick, N. J., 25th; Palmyra, N. Y., 24th, 27th; Factoryville, N. Y., 25th; Albany, Oregon, 12th, 13th, 21st, 22d, 31st; East Portland, Oregon, 6th; Linkville, Oregon, 3d, 7th, 12th to 14th, 17th, 22d, 27th, 29th, 30th; Dyberry, Pa., 25th; Ashwood, Tenn., 25th; Cleburne, Tex., 17th; Corsicana, Tex., 24th; Palestine, Tex., 24th to 25th; San Antonio, Tex., 17th; University of Virginia, Va., 1st; Rappahannock Va., 16th, 19th, 22d, 30th; Fort Canby, Wash., 21st; Green Bay, Wis., 2d.

*Ducks flying south.*—Fort Sully, Dak., 24th; Titusville, Fla., 26th, 28th; Cedar Rapids, Iowa, 20th; Monticello, Iowa, 4th; Wakefield, Kans., 26th; Yates Centre, Kans., 24th; Poplar River, Mont., 5th; Fort Assinaboine, Mont., 9th; Brownville, Nebr., 24th; Kitty Hawk, N. C., 25th, 26th; Tiffin, Ohio, 14th; Palestine, Tex., 4th, 25th, 26th; Silver Falls, Tex., 4th, 25th, 26th; Tatoosh Island, Wash., 2d to 7th, 9th.

*Cranes flying south.*—Fort Buford, Dak., 16th, 17th; Elk Falls, Kans., 20th; Wakefield, Kans., 13th; West Leavenworth, Kans., 25th, 26th, 28th to 30th; Yates Centre, Kans., 24th; Brownville, Nebr., 20th; Austin, Tenn., 5th; Corsicana, Tex., 13th; Rappahannock, Va., 31st.

*Brants flying south.*—Fort Madison, Iowa, 14th; West Leavenworth, Kans., 4th, 26th; East Portland, Oregon, 4th; Palestine, Tex., 24th.

#### MIRAGE.

Mirages were reported from the following places: Yuma, Ariz., 12th; Webster, Dak., 18th, 31st; Richardton, Dak., 27th; Salina, Kans., 4th, 5th, 9th, 21st, 22d, 25th, 26th; Marquette, Nebr., 3d, 16th, 17th, 18th; Galveston, Tex., 4th.

#### SAND STORMS.

Keeler, Cal.: a severe sand storm began 10.15 p. m. on the 6th, the wind reaching a maximum velocity of forty-two miles per hour at 10.25 p. m. The wind raised great clouds of sand which completely obscured the sky.

Los Angeles, Cal.: a severe sand storm occurred on the afternoon of the 7th, filling the air with dust and sand, and rendering travel difficult. The Sierra Madre range of mountains was obscured from view at the station. Maximum velocity of the wind, thirty-four miles per hour, at 2.30 p. m. The storm was general in this section and quite severe in the valleys, but no damage has been reported.

Fort Grant, Ariz.: a sand storm prevailed throughout the 10th; high easterly winds began 8.30 a. m. and continued, with increasing force, until midnight; maximum velocity, forty-eight miles per hour, from the east.

Sand storms also occurred at the following places: Fort Mojave, Ariz., 6th; Fresno, Cal., 6th, 7th, 11th; Keeler, Cal., 7th to 10th; Fort Thomas, Ariz., 11th; San Carlos, Cal., 11th, 29th.

#### SUN SPOTS.

Mr. H. D. Govey, of North Lewisburg, Champaign Co., Ohio, reports having observed sun spots on the following dates: 2d, 3d, 20th to 22d, 24th, 25th.

### VERIFICATIONS.

#### INDICATIONS FOR 33 HOURS IN ADVANCE.

In view of the fact that the multiplication of districts has largely increased the work of the verifications officer so as to materially delay his reports, and also interfere with other special work devolving upon him, the Chief Signal Officer has decided that hereafter the percentage of successful predictions be based on one only of the tri-daily indications. Since the 10 p. m. indications is the only one which includes predictions for the entire country, in connection with which the temperature and weather signals are displayed, the percentages will be calculated therefor. An additional reason for the selection of the 10 p. m. indications is the fact that an examination of

twelve consecutive months' percentages shows the average of the 10 p. m. indications to vary less than one-tenth of one per cent. from the general means. In order to make the data comparable, the official percentages for the current fiscal year have been recomputed, so as to show the detailed percentages with reference to the 10 p. m. indications.

The following paragraphs from Instructions No. 66, current series, are given in explanation of the method of verifying the indications:

In determining the percentage of verifications of predictions, the conditions occurring during the twenty-four hours predicted for, as shown by the charts for the 2d, 3d, and 4th reports following the report on which the prediction is